



## DECLARATION

I, Soo-jung Park, a Korean citizen of 8th Floor, Daelim Building 1600-3, Seocho-Dong, Seocho-Gu Seoul, Korea do hereby solemnly and sincerely declare as follows:

1. That I am well acquainted with the English and Korean languages.
2. That the following is a correct translation into English of Korean Patent Application No. 2003-09905 filed on February 17, 2003 and I make the solemn declaration conscientiously believing the same to be true.

Seoul, October 12, 2006



Soo-jung Park

[DOCUMENT]            Application for Patent

[CATEGORY OF RIGHTS]    Patent

[RECEIVING PERSON]        The commissioner

[DATE OF FILING]            February 17, 2003

5    [TITLE OF THE INVENTION-KOREAN]       레이저 스캔유닛 조립체 및 이를 구비  
한 레이저 프린터

[TITLE OF THE INVENTION-ENGLISH]       Laser scanning unit assembly and laser  
printer having the same

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          [SUPPORTING DOCUMENT]    unattached

30        [EXAMINATION REQUEST]    YES

[PURPOSE] I, hereby, submit the present application for the Patent and request the  
examination of the present invention under the Article 42 and the Article 60 of the Patent Law.

Attorney	Hong-sik JEONG (seal affixed)		
[Official Fee]			
[Basic fee]	20 pages	₩	29,000
[Additional fee]	2 pages	₩	2,000
[Claiming Priority Right]	1 case	₩	26,000
[Filing Request For Examination]	20 claims	₩	749,000
[Total]		₩	806,000
[Documents]	1. One copy of Abstract, Specification (& drawings)		

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**[ABSTRACT OF THE DISCLOSURE]**

**[Abstract]**

In a laser printer using a plurality of laser scan units, a laser scan unit is capable of manually adjusting a plurality of laser beams to be in parallel relations. Such a laser scan unit  
5 assembly includes a laser scan unit having a window on a front surface through which a laser beam is emitted, a hinge portion provided at one side of the laser scan unit for pivotably disposing the laser scan unit on the body, and an adjusting portion provided on the opposite side of the laser scan unit with the hinge portion, for adjusting an amount the laser scan unit pivots. The body has a hinge supporting portion provided thereon for supporting rotation of  
10 the hinge portion. The hinge portion is formed as a hinge shaft and the hinge supporting portion is formed as a groove for supporting the hinge shaft. The adjusting portion comprises a first adjusting means which is an inclined surface, and a second adjusting means which is a screw and provided on the body.

**[The main figure]**

15 FIG. 2

**[Search term]**

laser scan unit, hinge shaft, adjusting portion, screw, inclined surface, groove

## **[SPECIFICATION]**

### **[The title of the invention]**

Laser scanning unit assembly and laser printer having the same

### **[The brief description of the drawings]**

- 5 FIG. 1 is a perspective view showing a first embodiment of a laser scan unit assembly according to the present invention;  
FIG. 2 is a sectional view showing the laser scan unit of FIG. 1 assembled in a printer body;  
FIG. 3 is a side view showing a resilient member disposed in a hinge portion of FIG. 2;  
FIG. 4 is a sectional view showing a guiding ring assembled in a screw of FIG. 2;  
10 FIG. 5 is a side sectional view showing a pressing means disposed in an adjusting portion of FIG. 2;  
FIG. 6 is a sectional view showing two laser scan unit assemblies of FIG. 1 assembled in a printer body;  
FIG. 7 is a sectional view showing a laser scan unit assembly according to a second  
15 embodiment of the present invention assembled in a printer body;  
FIG. 8 is a sectional view showing a laser scan unit assembly according to a third embodiment of the present invention assembled in a printer body; and  
FIG. 9 is a sectional view showing a laser scan unit assembly according to a fourth  
embodiment of the present invention assembled in a printer body.

20

### **\*Description of the reference numerals in the drawings\***

- |  |                                       |
|--|---------------------------------------|
| 1: laser beam                          | 10: laser scan unit                   |
| 11: window                             | 20: hinge portion                     |
| 21: hinge shaft                        | 22: rotary shaft of the hinge portion |
| 25 25: hinge supporting portion        | 26: groove                            |
| 30, 30': adjusting portion             | 31: first adjusting means             |
| 32, 32': second adjusting means, screw | 35: guiding ring                      |
| 40, 41: printer body                   | 50: resilient member                  |
| 60: pressing means                     | 61: guiding rod                       |
| 30 62: spring                          | 64: fastening portion                 |
| 70: adjusting portion                  | 71: nut portion                       |
| 72: screw                              | 73: guiding ring                      |

75: second adjusting means

81: groove

80: hinge portion

85: hinge shaft

**[Detailed description of the invention]**

**[Object of the invention]**

**[The field of the invention and the related art]**

The present invention relates to a laser printer forming an image by scanning a  
5 plurality of laser beams, and more particularly, to a laser scan unit assembly capable of  
adjusting the plurality of laser beams from a plurality of laser scan units to be parallel with  
each other when scanned onto a photosensitive body, and a laser printer having the same.

Generally, a laser printer prints a predetermined image by forming the image on a  
photosensitive body using laser beams emitted from a laser scan unit, and then transferring  
10 the image onto paper. A particular type laser printer such as a color laser printer forms an  
electrostatic latent image on the photosensitive body by emitting a plurality of laser beams  
from a plurality of laser scan units. Since the plurality of laser scan units are disposed at  
predetermined intervals to be parallel with each other, the laser beams emitted from the laser  
scan units are formed on the photosensitive body at predetermined intervals in parallel  
15 relation and create an electrostatic latent image. The laser printer then develops the  
electrostatic latent image created on the photosensitive body with a developing agent and  
transfers the developed image onto paper to print the image.

Such a laser printer using a plurality of laser scan units may not have the laser beams  
emitted from each laser scan unit parallel with each other due to manufacturing tolerance of  
20 parts structuring the laser scan unit or an assembling error occurring when each laser scan  
unit is assembled. If the plurality of laser beams is not formed on the photosensitive body in  
parallel, each color may be mis-positioned thereby impairing print quality.

In order to solve such problem, conventionally, a laser scan unit assembly which is  
capable of adjusting the plurality of laser beams formed on the photosensitive body to be  
25 parallel with each other by adjusting the angles of the mirrors reflecting the laser beams  
emitted from the laser scan units has been designed. Since a mirror unit has a laser scan unit  
inside, it is general that such scan unit assembly is provided with a motor for adjusting the  
angle of the mirror. The laser beams are formed on the photosensitive body in parallel with  
each other by adjusting the angle of the mirrors by a control unit controlling the motor.

30 However, there are a few problems in the laser scan unit adjusting mirrors using the  
motor.

Firstly, since the laser scan unit has a motor disposed therein, the interior temperature

of the laser scan unit increases as the temperature of the motor increases when used for a long time, and therefore the life span of the laser scan unit is reduced.

Secondly, manufacturing costs are increased as an additional motor and motor control unit are required.

5           Lastly, separate space for disposing the additional motor is required thereby enlarging the size of the laser printer.

Therefore, there has been a need for a laser scan unit assembly capable of adjusting a plurality of laser beams to be emitted onto a photosensitive body in parallel with each other without having to use a motor.

10       **[Technical object of the invention]**

Exemplary embodiments of the present invention address at least the above problems and/or disadvantages and provide at least the advantages described below. Accordingly, an aspect of the present invention is to provide a scan unit assembly capable of manually adjusting a plurality of laser beams emitted from a plurality of laser scan units and formed on  
15       a photosensitive body to be parallel with each other.

Another aspect of the present invention is to provide a laser printer having a laser scan unit assembly capable of manually adjusting a plurality of laser beams formed on a photosensitive body to be parallel with each other.

**[Construction and operation of the invention]**

20           The foregoing and other objects and advantages are realized by providing a laser scan unit assembly disposed in a printer body comprising a laser scan unit having a window on a front surface through which a laser beam is emitted, a hinge portion provided at one side of the laser scan unit for pivotably disposing the laser scan unit on the body, and an adjusting portion provided on the opposite side of the laser scan unit with the hinge portion, for  
25       adjusting an amount the laser scan unit pivots. The body has a hinge supporting portion provided thereon for supporting rotation of the hinge portion.

The hinge portion is formed as a hinge shaft and the hinge supporting portion is formed as a groove for supporting the hinge shaft. In addition, the hinge supporting portion further comprises a resilient member for pressing the hinge shaft against the groove.

30           It is preferable that the hinge portion is formed as a groove and the hinge supporting portion is formed as a hinge shaft for supporting the groove.

In addition, the adjusting portion comprises a first adjusting means provided on the



opposite side of the laser scan unit and a second adjusting means provided on the body. The first adjusting means is an inclined surface and the second adjusting means is a screw or alternatively the first adjusting means is a screw and the second adjusting means is an inclined surface.

5 It is preferable that a guiding ring is further assembled at an end portion of the screw which is in contact with the inclined surface.

In addition, the adjusting portion further comprises a pressing means for pressing the first adjusting means against the second adjusting means.

According to another aspect of the invention, a laser printer having a photosensitive  
10 body on which an image is formed by the plurality of laser beams, a developing apparatus for developing the image formed on the photosensitive body and transferring the developed image onto paper, a paper convey apparatus for conveying the paper to the developing apparatus, and a plurality of laser scan unit assembly comprising a laser scan unit comprising  
15 a window through which a laser beam is emitted on the photosensitive body, a hinge portion provided at one side of the laser scan unit for pivotably disposing the laser scan unit on the body, and an adjusting portion provided on the opposite side of the laser scan unit with the hinge portion, for adjusting an amount the laser scan unit pivots, wherein distance between the plurality of laser beams is adjusted by the adjusting portion.

Hereinafter, a laser scan unit assembly according to exemplary embodiments of the  
20 present invention will be described in greater detail with reference to the accompanying drawings.

Referring to FIGS. 1 and 2, the laser scan unit assembly according to the first embodiment comprises a laser scan unit 10, a hinge portion 20, and an adjusting portion 30.

The laser scan unit 10 is an apparatus for scanning a laser beam 1, and formed of a  
25 unit having a laser light source, a collimator, a cylinder lens, a polygon mirror, an F- $\theta$  lens, and a reflector that are necessary for scanning the laser beam 1 contained in a single case. On the front surface of the laser scan unit 10, a window 11 is provided for emitting the laser beam 1.

The hinge portion 20 is for allowing the laser scan unit 10 to pivot with respect to the  
30 printer body 40 and provided at one side of the laser scan unit 10. That is, when the part of the laser scan unit 10 with the window 11 is considered as a front side, the hinge portion 20 is provided on one of the left and right sides 13, 14 of the laser scan unit 10. It is preferable

that the hinge portion 20 is formed as a hinge shaft 21, as shown in FIG. 1. It is also preferable that the rotary shaft 22 of the hinge portion 20 and the laser beam 1 emitted from the window 11 are in the same plane. In addition, a hinge supporting portion 25 is formed on the printer body 40 to which the laser scan unit assembly is disposed to correspond with the hinge portion 20. The hinge supporting portion 25 has a groove 26 for supporting the hinge portion 20 formed in the shape of the hinge shaft 21. It is preferable that the groove 26 is formed in V shape. In addition, it is preferable that the hinge shaft 21 is pressed by a resilient member 50 as shown in FIG. 3 for maintaining the hinge shaft 21 and the groove 26 to always stay in contact with each other. The resilient member 50 may use a metal plate having a predetermined resilience and is fastened onto the hinge supporting portion 25 by a plurality of screws 51. The resilience of the resilient member 50 is determined within a range in which the resilient member 50 can maintain the hinge shaft 21 to stay in contact with the groove 26 and at the same time allow the laser scan unit 10 to pivot freely up and down by the adjusting portion 30.

The adjusting portion 30 is for adjusting the amount the laser scan unit pivots around the hinge portion 20 and disposed on a side 14 opposite to the side 13 on which the hinge portion 20 of the laser scan unit 10 is formed. The adjusting portion 30 comprises a first adjusting means 31 disposed on the laser scan unit 10 and a second adjusting means 32 disposed on the printer body 41. As shown in FIG. 2, the first adjusting means 31 may be formed as an inclined surface 31a and the second adjusting means 32 as a screw moving forward and backward with respect to the inclined surface 31a. When the screw 32 is moved forward in the direction indicated by the arrow in FIG. 2, the laser scan unit 10 pivots upward on the hinge portion 20. When the screw 32 is pulled in the opposite direction of the arrow in FIG. 2, the laser scan unit 10 pivots downward on the hinge portion 20. At this time, it is preferable that the screw has a guiding ring 35 at an end portion 32a assembled thereon as shown in FIG. 4 in order to facilitate contact between the screw 32 and the inclined surface 31a. In addition, it is more preferable to further comprise a pressing means for pressing the first adjusting means 31 against the second adjusting means 32 with a predetermined pressure in order to ensure that the laser scan unit 10 pivots upward and downward by the screw 32. An example of such pressing means is shown in FIG. 5. Referring to FIG. 5, the pressing means 60 comprises a guiding rod 61 fastened on a fastening portion 64 and a spring 62 interposed between the first adjusting means 31 and the

guiding rod 61. The fastening portion 64 guides rectilinear movement of the screw 32 and is disposed on the printer body 41 for fastening the guiding rod 61. Therefore, the first adjusting means 31 presses the end portion 32a of the screw 32 which is the second adjusting means always with a predetermined pressure.

5 Hereinafter, the operation of the laser scan unit assembly structured as above is described.

When the end portion 32a of the screw is moved forward in the direction indicated by the arrow in FIG. 2 by turning the second adjusting means of the adjusting portion 30, i.e., the screw 32, the laser scan unit 10 pivots upward on the hinge shaft 21 by the inclined  
10 surface 31a of the first adjusting means 31. On the contrary, when the end portion 32a of the screw is pulled by turning the screw 32, the laser scan unit 10 pivots downward on the hinge shaft 21 by the inclined surface 31a.

When two laser scan unit assemblies are disposed on the printer body as shown in FIG. 6, laser beams emitted from the two laser scan units 10, 10' can be adjusted to be  
15 parallel with each other by adjusting the adjusting portions 30, 30' of each laser scan unit assembly. That is, the two laser beams can be formed on the photosensitive body (not shown) to be parallel with each other by turning the second adjusting means 32, 32' of each laser scan unit assembly thereby having the laser scan units 10, 10' to pivot upward and downward on the hinge portions 21, 21'.

20 The second embodiment of the laser scan unit assembly according to the present invention is shown in FIG. 7. Referring to FIG. 7, the laser scan unit assembly according to the second embodiment comprises a laser scan unit 10, a hinge portion 20, and an adjusting portion 70.

A detailed description of the laser scan unit 10 for emitting a laser beam will be  
25 omitted as it is identical to that of the first embodiment.

The hinge portion 20 is for allowing the laser scan unit 10 to pivot with respect to the printer body 40, and provided at one side of the laser scan unit 10. The structure of the hinge portion 20 is also identical to that of the first embodiment and therefore will not be described again.

30 The adjusting portion 70 is for adjusting the amount the laser scan unit 10 pivots on the hinge portion 20 and is provided on a side 14 opposite to the side 13 on which the hinge portion 20 of the laser scan unit 10 is provided. The adjusting portion 70 comprises a first

adjusting means disposed on the laser scan unit 10 and a second adjusting means 75 disposed on the printer body 41. As shown in FIG. 7, the first adjusting means is formed as a screw 72 and the second adjusting means 75 is formed as an inclined surface 75a. The screw 72 is assembled in a nut portion 71 formed in the laser scan unit 10 so that the screw 72 can move rectilinearly. The inclined portion 75a inclines so that the laser scan unit 10 rises when the screw 72 is moved forward in the direction shown by the arrow in FIG. 7 and is fastened on the printer body 41. Therefore, when the screw 72 is turned to be moved forward, the laser scan unit 10 pivots upward by the inclined surface 75a of the second adjusting means. When the screw 72 is turned in the opposite direction shown by the arrow in FIG. 7 to be moved backward, the laser scan unit 10 pivots downward by the inclined surface 75a of the second adjusting means. As described in the first embodiment, the guiding ring 73 may be assembled on the end portion 72a of the screw in order to facilitate contact between the end portion 72a of the screw and the inclined surface 75a, and also the pressing means for pressing the first adjusting means against the second adjusting means 75 with a predetermined pressure may further provided in order to ensure that the laser scan unit 10 pivots upward and downward by the screw 72.

A third embodiment of the laser scan unit assembly according to the present invention is shown in FIG. 8. Referring to FIG. 8, the laser scan unit assembly according to the third embodiment comprises a scan unit 10, a hinge portion 80, and an adjusting portion 30.

The scan unit 10 is an apparatus for emitting a laser beam, and will not be described in detail again as it is identical to that of the first embodiment.

The hinge portion 80 is for allowing the laser scan unit 10 to pivot on the printer body 40, and provided at one side 13 of the laser scan unit 10. As shown in FIG. 8, the hinge portion 80 is formed as a groove 81. It is preferable that the groove 81 is formed in V shape. In addition, a hinge supporting portion 85 is formed on the printer body 40 to which the laser scan unit assembly is disposed to correspond with the hinge portion 80. The hinge supporting unit 85 is formed as a hinge shaft which can support the hinge portion 80 formed as a groove 81. In addition, a resilient member for pressing the groove 81 to the hinge shaft 85 may be disposed as the first embodiment in order to maintain the groove 81 of the hinge portion 80 and the hinge shaft 85 to always stay in contact with each other.

The adjusting portion 30 is for adjusting the amount the laser scan unit 10 pivots around the hinge portion 80, and disposed on a side 14 opposite to the side 13 on which the hinge portion 80 of the laser scan unit 10 is formed. The adjusting portion 30 is identical to that of the laser scan unit in the described first embodiment and therefore a detailed description will be omitted.

Therefore, also in case of the third embodiment, if the screw 32 of the adjusting portion 30 is turned to be moved forward, the laser scan unit 10 pivots upward, but on the contrary, if the screw 32 is turned to be moved backward, the laser scan unit 10 pivots downward, and accordingly the laser beams can be adjusted to keep parallel with each other.

FIG. 9 shows the fourth embodiment of the laser scan unit assembly according to the present invention. Referring to FIG. 9, the laser scan unit assembly according to the fourth embodiment comprises a laser scan unit 10, a hinge portion 80, and an adjusting portion 70.

The laser scan unit 10 is an apparatus for emitting a laser beam, and will not be described in detail again as it is identical to that of the first embodiment.

The hinge portion 80 is for allowing the laser scan unit 10 to pivot on the printer body 40, and provided at one side 13 of the laser scan unit 10. The structure of the hinge portion 80 will not be described again as it is identical to that of the third embodiment.

The adjusting portion 70 is for adjusting the amount the laser scan unit 10 pivots around the hinge portion 80, and disposed on a side 14 opposite to the side 13 on which the hinge portion 80 of the laser scan unit 10 is formed. The adjusting portion 70 is identical to that of the laser scan unit in the described second embodiment and therefore a detailed description will be omitted.

Therefore, also in case of the fourth embodiment, if the screw 72 of the adjusting portion 70 is turned to be moved forward, the laser scan unit 10 pivots upward, but on the contrary, if the screw 72 is turned to be moved backward, the laser scan unit 10 pivots downward, and accordingly the laser beams can be adjusted to keep parallel with each other.

According to the laser scan unit assembly according to the present invention described above, a plurality of laser beams can be adjusted to be formed on the photosensitive body to be parallel with each other by manually turning the adjusting portion. Accordingly, there is no likelihood of the life span of the laser scan unit being shortened due to temperature increase of the motor, and manufacturing costs may be reduced as there is no need for

disposing a motor inside the laser scan unit. In addition, the size of a laser printer may be reduced since no separate space is required for disposing a motor control unit.

**[Effect of the invention]**

According to the laser scan unit according to the present invention described above,  
5 it is possible to manually adjust a plurality of laser beams emitted from a plurality of laser scan units and formed on a photosensitive body to be parallel with each other.

Additionally, the present invention provides a laser printer having a laser scan unit assembly capable of manually adjusting a plurality of laser beams formed on a photosensitive body to be parallel with each other.

10 The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present invention. The present teaching can be readily applied to other types of apparatuses. The description of the present invention is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art. In the claims, means-plus-function  
15 clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures.

**[What is claimed is]**

1. A laser scan unit assembly disposed in a printer body, the assembly comprising:  
a laser scan unit having a window on a front surface through which a laser beam is  
5 emitted;  
a hinge portion provided at one side of the laser scan unit for pivotably disposing the  
laser scan unit on the body; and  
an adjusting portion provided on the opposite side of the laser scan unit with the  
hinge portion, for adjusting an amount the laser scan unit pivots.  
10
2. The laser scan unit assembly as claimed in claim 1, wherein the body has a hinge  
supporting portion provided thereon for supporting rotation of the hinge portion.
3. The laser scan unit assembly as claimed in claim 2, wherein the hinge portion is  
15 formed as a hinge shaft and the hinge supporting portion is formed as a groove for supporting  
the hinge shaft.
4. The laser scan unit assembly as claimed in claim 3, wherein the hinge supporting  
portion further comprises a resilient member for pressing the hinge shaft against the groove.  
20
5. The laser scan unit assembly as claimed in claim 2, wherein the hinge portion is  
formed as a groove and the hinge supporting portion is formed as a hinge shaft for supporting  
the groove.
- 25 6. The laser scan unit assembly as claimed in claim 1, wherein the adjusting portion  
comprises a first adjusting means provided on the opposite side of the laser scan unit and a  
second adjusting means provided on the body.
7. The laser scan unit assembly as claimed in claim 6, wherein the first adjusting  
30 means is an inclined surface and the second adjusting means is a screw.
8. The laser scan unit assembly as claimed in claim 6, wherein the first adjusting

means is a screw and the second adjusting means is an inclined surface.

5 9. The laser scan unit assembly as claimed in any one of claims 7 or 8, wherein a guiding ring is further assembled at an end portion of the screw which is in contact with the inclined surface.

10 10. The laser scan unit assembly as claimed in claim 6, wherein the adjusting portion further comprises a pressing means for pressing the first adjusting means against the second adjusting means.

11. A laser printer forming an image using a plurality of laser beams, the printer comprising:  
a photosensitive body on which an image is formed by the plurality of laser beams;  
a developing apparatus for developing the image formed on the photosensitive body  
15 and transferring the developed image onto paper;  
a paper convey apparatus for conveying the paper to the developing apparatus; and  
a plurality of laser scan unit assembly comprising,  
a laser scan unit comprising a window through which a laser beam is emitted  
on the photosensitive body,  
20 a hinge portion provided at one side of the laser scan unit for pivotably disposing the laser scan unit on the body, and  
an adjusting portion provided on the opposite side of the laser scan unit with the hinge portion, for adjusting an amount the laser scan unit pivots,  
wherein distance between the plurality of laser beams is adjusted by the adjusting  
25 portion.

12. The laser printer as claimed in claim 11, wherein a body of the laser printer has a hinge supporting portion provided thereon for supporting rotation of the hinge portion.

30 13. The laser printer as claimed in claim 12, wherein the hinge portion is formed as a hinge shaft and the hinge supporting portion is formed as a groove for supporting the hinge shaft.



14. The laser printer as claimed in claim 13, wherein the hinge supporting portion further comprises a resilient member for pressing the hinge shaft against the groove.

5           15. The laser printer as claimed in claim 12, wherein the hinge portion is formed as a groove, and the hinge supporting portion is formed as a hinge shaft supporting the groove.

16. The laser printer as claimed in claim 11, wherein the adjusting portion comprises a first adjusting means provided on the opposite side of the laser scan unit and a second  
10   adjusting means provided on the body.

17. The laser printer as claimed in claim 16, wherein the first adjusting means is an inclined surface and the second adjusting means is a screw.

15           18. The laser printer as claimed in claim 16, wherein the first adjusting means is a screw and the second adjusting means is an inclined surface.

19. The laser printer as claimed in any one of claims 17 or 18, wherein a guiding ring is further assembled at an end portion of the screw which is in contact with the inclined  
20   surface.

20. The laser printer as claimed in claim 16, wherein the adjusting portion further comprises a pressing means for pressing the first adjusting means against the second adjusting means.